NOTES

THE following are the names of the fifteen candidates who have been selected by the Council of the Royal Society, for election this year into that body:—William Aitken, M.D., Sir Alexander Armstrong, M.D., K.C.B., Robert Stawell Ball, LL.D., John Beddoe, M.D., Frederick Joseph Bramwell, C.E., Staff-Captain Edward Kilwick Calver, R.N., Robert Lewis John Ellery, F.R.A.S., Lieut.-Col. J. Augustus Grant, C.B., C.S.I., Clements Robert Markham, C.B., George Edward Paget, M.D., George West Royston-Pigott, M.D., Osbert Salvin, M.A., The Hon. John William Strutt, M.A., Henry Woodward, F.G.S., James Young, F.C.S.

THE University of Cambridge has accepted the offer made by Dr. Anton Dohrn of the Zoological Station at Naples, through Dr. Michael Foster and Prof. Newton, of a working table in the laboratory of the station; and last week, on the recommendation of the Board of Natural Sciences, a grace passed the senate without opposition to the effect that from the Worts Travelling Bachelors' Fund the sum of 100*l*. per annum be granted for three years, for the purpose of securing to such members of the University, as the Board shall from time to time nominate, facilities of studying in the station.

WITH reference to a short article entitled "Survival of the Fittest," in NATURE, vol. vii. p. 404, Prof. L. Agassiz writes us that the observations therein attributed to him are taken from an unauthorised newspaper report, from which we infer that he disclaims them.

WITH reference to our report of the American Philosophical Society for August 16, 1872 (NATURE, vol. vii. p. 335), Prof. Cope writes that we have been misinformed as to the date at which his communication on the discovery of Proboscidia in the Wyoming Eocene was communicated to the Society. The paper was not announced to the Society till its meeting on September 20, and was not published till February 6, 1873.

MR. PENGELLY writes us that the specimens referred to by Mr. Everett (NATURE, April 17) did reach him through Mr. Everett's mother, and were duly acknowledged. The labels were rotten with wet, and the specimens consisted of shells and bones, the latter including human teeth and portions of a skull, incisors of some rodent, and a large hog-like molar.

PENIKESE ISLAND, the gift of which for the study of natural history to Prof. Agassiz by Mr. Anderson we have already more than once spoken of, was handed over by the donor on Monday, April 21, in a very simple way, accompanied by some speechmaking. Prof. Agassiz and his generous admirer then met for the first time, and for the first time Agassiz set foot on the future sphere of his labours. The short deed of conveyance was read and handed over, and Prof. Agassiz briefly returned thanks, announcing that he intended to christen the institution to be founded on the island, "The Anderson School of Natural History." Preparations for the school, which will open this summer, will be immediately commenced. Plans have already been drawn for a two-story wooden building 100 ft. long and 25 ft. wide. The lower floor is intended for laboratories and working-rooms, of which there will be eight, with a large hall. The second story will contain twenty-six sleeping-rooms, two bath-rooms, and a large room for the Superintendent of the Institution. Several friends of Mr. Anderson in New York have become interested in the school, and will probably give liberally towards its endowment. The island of Penikese, Penekese, or Penequese, and often called Pune by the pilots, is one of a group of the Elizabethan Isles, lying between Buzzard's Bay and Vineyard Sound, and stretching southward from Cape Cod to a point nearly opposite the coast of Rhode Island. Penikese is just inside and on starboard hand of the entrance to Buzzard's Bay. It is twelve miles from New Bedford. The island is three-fourths of a mile long and half a mile wide, and contains ninety-seven acres of land, some of which is of good quality. A young tree was pointed out that had grown in one season higher than anybody in the party could reach. The surface is hilly, the highest point being about a hundred feet above the water. Mr. Anderson reserves a peninsula of some fifteen acres on the east end of the island, and here he proposes to build a house next year. Prof. Agassiz states that Penikese is a much better location for the school than the one originally contemplated at Nantucket. The school is to be devoted mainly to the study of fish and marine objects in the summer season, and a much larger variety is found in Penikese. The Sound and waters in the vicinity of Nantucket have almost invariably a sandy bottom, while the diversity in marine topography in Buzzard's Bay invites and fosters a corresponding variety of animal and vegetable life.

AT the meeting of the Iron and Steel Institute recently held in London, Mr. Lowthian Bell was elected president, and delivered a very interesting address. He pointed out the great success which had attended the organisation of the society, which although only in the fifth year of its existence, now numbered on its rolls 522 members. He expressed his opinion that the Institute had far from reached its limits. Referring then to the instances which still exist here and there, of a disregard for scientific inquiry, the result, perhaps, of considerable success effected independently of philosophical research, in which cases practical experience, as it is called, is the only rule admitted, Mr. Bell remarked, that on the other hand, abstract science, correct as it may be in every step employed in its elaboration, when introduced into the workshop may be found unable to stand the rude but inevitable test of commercial practicability; hence the necessity of a convenient method of effecting a sound union between these two great principles, and to obtain this was the object of the organisation of the Iron and Steel Institute, where are brought face to face men, some distinguished for their practical knowledge, and others equally eminent for their attachments to scientific observation. He then proceeded to consider the present aspect of foreign competition, and thought the progress in other countries in iron manufacture had arisen from an adaptation of our own appliances, and not from any important discoveries abroad. In speaking of the recent scarcity of coal, although it was his impression that an important addition can and will be made to their present output, he yet contemplated the possibility of a time being now approaching when "any extension of manufacturing operation in this country would have to be regulated, not by the requirements of society for their produce, but by the means our coal mines might possess of furnishing the fuel required. Mr. Bell, after referring to several improvements in the plant and processes for manufacturing iron, looking forward to the future, expressed his opinion that, unless new discoveries of coal be made in Europe, the great rival we have to fear in the iron manufacture is the United States, which possesses unlimited quantities of ores of the finest quality, and such enormous deposits of coal, that our own wealth in that mineral is but comparative poverty. At the proceedings on April 30, a paper by Dr. C. William Siemens, "On the Manufacture of Iron and Steel by Direct Process," was read. Dr. Siemens described his rotative regenerative gas furnace.

A SPECIAL meeting of the Council and Natural History Committee of the Asiatic Society was held at Calcutta a few weeks since, for the purpose of considering Mr. Schwendler's scheme for the establishment of a Zoological Garden in Calcutta. After considerable discussion it was resolved that the Council of the Society should once more record their opinion as to the great advantage to Natural History Science, as well as to the public which would result from the successful establishment of a Zoological Garden. In addition a Committee was appointed to report on the scheme. Few places are more suitable for the establishment of such gardens than Calcutta—climate, facilities for procuring animals, and an enormous floating population are all in their power. We are glad to learn that several of the native princes have already promised large donations, and that the local and Imperial Governments will give the scheme their support.

DR. SCHOMBURGK'S Report on the Botanic Garden at Adelaide, South Australia, gives an interesting view of the usefulness of such an institution in a new country. Although, according to the director, young Australia has very little taste for the science of botany, yet the number of persons who frequent the gardens for the purpose of getting various kinds of information increases yearly. Part of the report deals with the subject of state conservation of forests. In many districts of the colony the supply of wood for timber and fuel appears to be altogether exhausted, or is soon about to become so. The effect of the *déboisement* on the climate is much dreaded by Dr. Schomburgk, and no doubt, even if the belief in a diminution of the rainfall be not well founded, clearing certainly promotes evaporation, and sooner or later brings about the drying up of springs. Various economic plants have been introduced, including esparto (*Macrochloa tenacissima*). The climate allows of the planting out of many palms in the open air, such as *Latania borbonica*, *Rhapis flabelliformis*, *Sabal Blackburniana*, several species of *Chamærops* and others. There are grand possibilities for a well-managed botanic garden in such a climate.

THE third part of Mr. D. G. Elliott's superb "Monograph of the Paradiseidæ or Birds of Paradise," has just been published, it contains six plates beautifully executed by Mr. Wolf and Mr. Smit.

THE first part of a new biological work has recently been published at Moscow, entitled "Pripoda"—popularnoi estestvenno—istoricheski saornik. It contains a paper by M. Severtzoff on the sheep of Asia, but from being written in Russian, it is beyond the reach of most English readers, and would probably be worthy of translation.

LETTERS received from Mr. R. Swinhoe announce his removal from the Consulship of Ning-po to the more northern Chinese port of Che-fow, on the south shore of the Gulf of Petchelee. M. Swinhoe also announces the despatch of a living specimen of the very interesting hornless deer, *Hydropotes inermes*, first described by him in 1870, for the Zoological Society's Menagerie.

WE understand that Dr. John Anderson, F.Z.S., director of the Indian Museum at Calcutta, will return to England in the autumn for a leave of two years.

WE learn from *Sirius* that the Russian Government has devoted 70,000 roubles to the observation of the Transit of Venus, and is to send out twenty-four expeditions to various parts of the world.

FROM *Sirius* we learn that recently 84 pages of a manuscript of Copernicus have been discovered.

THE Archæological Institute of Great Britain and Ireland will hold its annual meeting at Exeter on July 29 and following days. Lord Devon has consented to fill the office of President.

THE Royal Microscopical Society hold a conversazione in the Large Hall, King's College, on Wednesday evening, May 14.

IN reference to the Natural Science Scholarship at Trinity College, Cambridge, to which, as mentioned last week, Mr. Bridge has just been elected, we are informed that Mr. Alfred Milnes Marshall, of St. John's College, was also highly recommended by the examiners for a second scholarship, but the master and seniors decided that only one should be given. Mr. Bridge, we may add, has for some time past, been a non-collegiate member of the University.

A VERY interesting publication is the "Memoir of the Founding and Progress of the U.S. Naval Observatory," at Washington, prepared by Prof. J. E. Nourse, by order of Rear-Admiral B. F. Sands, the present Superintendent of the observatory. The large pamphlet gives details of the history of the observatory from the first attempt in 1810 to move the American Government to take steps to establish a meridian for America, so as to make that country independent of the meridians of Greenwich and Paris, down to the present time, when by the liberality of the Government and the zeal and knowledge of American astronomers and meteorologists, it has become one of the most efficient observatories in the world. The present observatory was founded in 1842, and the first superintendent was the late Commander M. F. Maury, whose successors have been Capt. J. M. Gilliss, Rear-Admiral C. H. Davis, and Rear-Admiral B. F. Sands. In their attempts to render their observations, astronomical, meteorological, and magnetic, as thorough and wide as possible, the officials have been well backed by the American Government, the result being, as we have said, that the observatory is perhaps the most efficient institution of the kind in the world, both with regard to the higher aims and the practical results of the sciences with which it is connected. Every year, almost every month, as the readers of our "Notes" must have seen, are new ramifications being developed, and new means of greater efficiency being added. For the purpose of circulating accurate time, the observatory is connected with all the telegraphic offices in the United States, and every day at 12 o'clock, the exact time is by this means made known throughout the country. At present, as we noted some time ago, there is being constructed for the observatory by Messrs. Clark, of Cambridgeport, at a cost of 50,000 dollars, a refracting telescope of the largest size; and as we also noted several months since, preparations on the most liberal scale are being made for observing the forthcoming Transit of Venus.

A CORRESPONDENT puts the following case:—A strong man is suddenly struck dead by lightning. What has become of the potential energy he possessed the instant before he was struck? To this we have received the following reply:—His potential energy would be where it was before, viz., within the space bounded by his external surface. What the lightning has done has been to destroy the mechanism for realising that potential energy. A small portion of the man's potential energy might have been converted into actual energy by the lightning, as, for instance, in the shape of heat; but the great bulk would be got by anybody who chose to eat his body.

AN International Monument to the late Commodore Maury has been proposed, and there is no doubt his memory well deserves such a tribute. It has been mooted that an appropriate form in which to embody the monument would be a lighthouse on Rocos, which is sighted by all vessels on the route to Rio de Janeiro.

AT a meeting held in Edinburgh last week, it was resolved to appeal to the public for subscriptions in order to procure the erection in Edinburgh of Mrs. D. O. Hill's statue of Dr. Livingstone. The sum proposed to be raised is 3,500*l*.

THE U.S. signal office has begun the publication of a brief monthly review of the weather, in which special attention is, of course, given to the storms that visit the United States. It appears from these that there were enumerated during the month of January twelve storms, during February ten, and during March eleven. The paths pursued by the centres of these storms are classified as follows:—Twenty-one passed from the Upper Missouri Valley, and possibly from Oregon and British Columbia, eastward, over the lakes to Canada or New England; nine passed from the south-west, north and eastward, to the Middle or Eastern States; three passed from the south-west, eastward, to the South Atlantic States, and thence north-eastward; and two passed up north-eastward some distance off the Atlantic coast. Several of these storms divided into two portions, pursuing separate routes; and, with but one or two exceptions, they all increased in severity as they advanced eastward. The rainfall returns show a general deficiency on the Pacific coast; that, however, which was reported in the States east of the Rocky Mountains in March is probably compensated by the excess during January and February. During the entire three months the temperature has been colder than usual—at least for the country east of the Rocky Mountains.

WE have received the programme of the Leeds Naturalist's Field Club for the quarter April to June, from which we see that alternately with "exhibition of specimens and conversation," which takes place once a fortnight, papers on subjects of scientific interest are to be read. Excursions also take place on an average once a fortnight, the first object of the Club being "the minute investigation of the natural history, in all its branches, of the immediate neighbourhood of Leeds, and a more general investigation of the whole of the West Riding." This Society was founded in 1870, and was reorganised on a broader basis in March 1872, and seems to be doing good work.

A CORRESPONDENT writes, asking information with reference to the etymology of the word *aphis*.

THE following additions to the Brighton Aquarium have been made during the past week:—Picked Dogfish (*Acanthias vulgaris*), Larger Spotted Dog-fish (*Scyllium stellare*), Lesser do. (*Scyllium canicula*), Monkfish (*Rhina squatina*), Spotted Rays (*Raja maculata*), Sharp-nosed do. (*Raja lintea*), Streaked Gurnards (*Trigla lineata*), Grey Gurnards (*Triglia gurnardus*), Greater Weevers (*Trachinus draco*), Lesser do. (*Trachinus vipera*), Gemmeous Dragonets (*Callionymus lyra*), Lump Fish (*Cyclopterus lumpus*), Sea Snail (*Liparis vulgaris*), Yarrell's Blenny (*Blenniops ascani*), Sand Smelts (*Atherina presbyter*), Turbot (*Rhombus maximus*), Brill (*Rhombus lævis*), Sail Fluke (*Rhombus punctatus*), Plaice (*Pleuronectes platissa*), Flounders (*Pleuronectes flesus*), Soles (*Solea vulgaris*), Minnows (*Leuciscus phoxinus*), Tench (*Tinca vulgaris*), Masked Crab (*Corystes cassivelanus*), Tube Worms (*Serpula contortuplicata*), Sea Mice (*Aphrodite aculeata*), Sun Starfish (*Solaster papposa*), Mediterranean Corals (*Balanophyllia verrucari*), Golden Cup Coral (*Balanophyllia regia*), Devonshire Cup Coral (*Caryophyllia smithii*), Sea-fingers (*Alcyonium digitatum*), Sea-anemones (various).

THE additions to the Zoological Society's Gardens during the past week include an Indian leopard (*Felis pardus*), two Indian jackals (*Canis aureus*), presented by Capt. Henry; a Malabar Squirrel (*Sciurus maximus*), presented by Mr. Whiteside; three Egyptian cats *Felis chaus* (?) from Cashmere, presented by Capt. J. J. Bradshaw; two Egyptian geese (*Chenalopex ægyptiaca*), presented by Mr. H. W. Thornton; a hawfinch (*Coccothraustes vulgaris*), from the British Isles, presented by the Viscountess Downe; four European Terrapins (*Emys lutaria*) and a green lizard (*Lacerta viridis*, var. *chloronotus*), presented by Lord A. Russell; two black-handed spider monkeys *Ateles melanochir*); a white-throated Capuchin (*Cebus hypoleucus*); a blue-fronted Amazon (*Chrysotis æstiva*); a yellow-fronted Amazon (*C. ochrocephala*), and an orange-winged Amazon (*C. amazonica*), from Cartagena; a crested agouti (*Dasyprocta cristata*) from Colon; an alligator, and a red and yellow macaw (*Ara chloroptera*), from Barauquilla; a golden eagle (*Aquila chrysaëtus*), purchased; a bladder-nosed seal (*Cystophora cristata*), from the North Atlantic, deposited.

*ON THE HYPOTHESES WHICH LIE AT THE BASES OF GEOMETRY**

III.—*Application to Space.*

§ 1.—BY means of these inquiries into the determination of the measure relations of an n-fold extent the conditions may be declared which are necessary and sufficient to determine the metric properties of space, if we assume the independence of line-length from position and expressibility of the line-element as the square root of a quadric differential, that is to say, flatness in the smallest parts.

First, they may be expressed thus: that the curvature at each point is zero in three surface-directions; and thence the metric properties of space are determined if the sum of the angles of a triangle is always equal to two right angles.

Secondly, if we assume with Euclid not merely an existence of lines independent of position, but of bodies also, it follows that the curvature is everywhere constant; and then the sum of the angles is determined in all triangles when it is known in one.

Thirdly, one might, instead of taking the length of lines to be independent of position and direction, assume also an independence of their length and direction from position. According to this conception changes or differences of position are complex magnitudes expressible in three independent units.

§ 2.—In the course of our previous inquiries, we first distinguished between the relations of extension or partition and the relations of measure, and found that with the same extensive properties, different measure-relations were conceivable; we then investigated the system of simple size-fixings by which the measure-relations of space are completely determined, and of which all propositions about them are a necessary consequence; it remains to discuss the question how, in what degree, and to what extent these assumptions are borne out by experience. In this respect there is a real distinction between mere extensive relations, and measure relations; in so far as in the former, where the possible cases form a discrete manifoldness, the declarations of experience are indeed not quite certain, but still not inaccurate; while in the latter, where the possible cases form a continuous manifoldness, every determination from experience remains always inaccurate: be the probability ever so great that it is nearly exact. This consideration becomes important in the extensions of these empirical determinations beyond the limits of observation to the infinitely great and infinitely small; since the latter may clearly become more inaccurate beyond the limits of observation, but not the former.

In the extension of space-construction to the infinitely great, we must distinguish between *unboundedness* and *infinite extent*, the former belongs to the extent relations, the latter to the measure-relations. That space is an unbounded three-fold manifoldness, is an assumption which is developed by every conception of the outer world; according to which every instant the region of real perception is completed and the possible positions of a sought object are constructed, and which by these applications is for ever confirming itself. The unboundedness of space possesses in this way a greater empirical certainty than any external experience. But its infinite extent by no means follows from this; on the other hand if we assume independence of bodies from position, and therefore ascribe to space constant curvature, it must necessarily be finite provided this curvature has ever so small a positive value. If we prolong all the geodesics starting in a given surface-element, we should obtain an unbounded surface of constant curvature, *i.e.*, a surface which in a *flat* manifoldness of three dimensions would take the form of a sphere, and consequently be finite.

§ 3. The questions about the infinitely great are for the interpretation of nature useless questions. But this is not the case with the questions about the infinitely small. It is upon the exactness with which we follow phenomena into the infinitely small that our knowledge of their causal relations essentially depends. The progress of recent centuries in the knowledge of mechanics depends almost entirely on the exactness of the construction which has become possible through the invention of the infinitesimal calculus, and through the simple principles discovered by Archimedes, Galileo, and Newton, and used by modern physic. But in the natural sciences which are still in want of simple principles for such constructions, we seek to discover the causal relations by following the phenomena into great minuteness, so far as the microscope permits. Questions

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* (Continued from page 17.)